

A cross-sectional study of thrombocytopenia and bleeding in dengue fever: Burkina Faso is experiencing a dengue outbreak

Carol Green

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ABSTRACT

The Indeed, *Aedes aegypti* (the primary vector) and *Aedes albopictus* (the secondary vector) have spread globally in recent years, aided by a variety of factors such as globalisation of trade, rapid urbanisation in developing countries associated with high population density, and rapid urbanisation in developed countries. Indeed, *Aedes aegypti* (the primary vector) and *Aedes albopictus* (the secondary vector) have spread globally in recent years, aided by a variety of factors such as trade globalisation, rapid urbanisation

in developing countries associated with high population growth rates, and insufficient vector control. Inadequate water supply, as well as a deficient waste management system. In Africa, there is a scarcity of reliable epidemiological data on infections. Because of the widespread belief that fevers are caused by malaria.

Dengue fever is one of the most prevalent arboviruses in the tropics. It is a potentially fatal disease, with approximately 500,000 cases of severe dengue each year and 2.5 % of deaths worldwide. While this endemic disease is well-known in Africa, several data sources indicate a lack of understanding about its epidemiology. As well as severity in this area. Dengue fever outbreaks have occurred in several West African countries.

Key Words: *Thrombocytopenia; Arboviruses*

INTRODUCTION

Over the last decade In the meantime, the medical and clinical environment is characterised by a lack of diagnostic capacity and a lack of knowledge about infection and clinical signs among locals health-care workers Furthermore, until now, the disease has been extremely rare .The current surveillance system is insufficient . Dengue fever is a mosquito-borne endemic viral disease that has recently spread rapidly throughout the WHO's tropical and subtropical regions (WHO, 2017). The virus is transmitted to humans via the bite of female infected mosquitos, primarily *Aedes aegypti*, but also, to a lesser extent, *Aedes albopictus*. *Aedes albopictus* is the scientific name for the mosquito *Aedes albopictus* (WHO, 2009). Chikungunya, yellow fever, and Zika viruses are also spread by this vector.

Dengue fever affects approximately 390 million people worldwide each year, according to the World Health Organization, and approximately 96 million people die as a result of the disease. Millions of people require medical assistance. The majority of infected individuals live in tropical and subtropical regions [1].

Asia, Africa, Latin America, and the Pacific are the Asian, African, Latin American, and Pacific regions (WHO, 2016). Since 1925, several outbreaks have been reported in Burkina Faso, including one declared by the Burkina Faso Ministry of Health (MoH) in November 2013. Between 5 August and 12 November 2016, the Burkina Faso Ministry of Health (MoH) conducted an outbreak investigation as part of an emergency response in collaboration with the World Health Organization (WHO), and 1266 suspected dengue cases were identified, with 1061 cases positive by dengue Rapid Diagnostic Test (RDT) and 15 deaths from all 12 districts of Ouagadougou. Most recently, an even larger outbreak occurred in September 2017, with 9029 suspected dengue cases, 5773 dengue RDT-positive cases, and 18 deaths across the country. These repeated outbreaks indicate that Burkina Faso has a significant dengue burden.

Most African countries do not have mandatory dengue reporting or national surveillance systems. In 2016, Burkina Faso added dengue to its routine national surveillance system for epidemic-potential diseases. In addition, the Ministry of Health investigates outbreaks at a number of sentinel health centers [2].

A passive facility-based fever surveillance study in Ouagadougou was

conducted from 2014 to 2017 to better understand the dengue problem in Burkina Faso. The 2016 dengue outbreak occurred during the study period, allowing for the characterization of dengue epidemiology and the comparison of clinical features during and after the outbreak.

In most cases (up to 50% or more), DENV infection is asymptomatic or mild, with symptoms similar to flu or other endemic fever diseases (malaria and chikungunya fever) in Africa. Each year, however, approximately 500,000 people are hospitalised for severe dengue fever, a potentially fatal complication caused by plasma leakage, fluid accumulation, respiratory distress, profuse haemorrhages, or organ failure. According to, the mortality rate is around 2.5%. The pathogenesis and pathophysiology of severe DENV infection remain unknown. However, some potential contributory factors, such as age, gender, race, co-morbidities, and viral-specific features, are described as playing a role in disease outcomes.

In 2014, the presence of three DENV serotypes (types 1, 2, and 3) was reported in Ouagadougou, the capital of Burkina Faso (Valery, 2014). However, there are currently four serotypes circulating in Burkina Faso.

Burkina Faso experienced a dengue fever outbreak in the fourth quarter of 2016, with a total of 2526 suspected cases, 1561 probable cases, and 20 recorded deaths. It should also be noted that there has been an increase in the weekly incidence of dengue cases since week 31 of 2017. This was studied in various regions of Burkina Faso, but the current study only concerns the Hauts-Bassins region.

The study's design and population

The study was conducted in seven general public hospitals and private clinics that reported DENV cases to the Ministry of Health in Ouagadougou, Burkina Faso's capital. It has a Soudano-Saharan climate with a rainy season from May to October and a dry season from December to May. It had approximately 2.6 million inhabitants in 2016 and has been rapidly urbanised over the last quarter-century, with spectacular spatial growth. It is distinguished by parcelled neighbourhoods adjacent to non-parcelled ones ('non-lotis') that lack water supply, sanitation, and waste management systems.

This was a cross-sectional study that looked back at patient medical records for dengue fever patients in Ouagadougou (Burkina Faso's capital city) from January 1, 2015 to December 31, 2017. Ouagadougou is located in

Editorial Office, Journal of Blood Disorder and Treatment, United Kingdom.

Correspondence: Carol Green, Editorial Office, Journal of Blood Disorder and Treatment, United Kingdom, Email blooddisorder@medsci.org
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Green C.

the Kadiogo province on the central plateau (12.4°N1.5°W). The total population is estimated to be around 2.700.000 people, with men making up 48% of the population and women making up 52%. We looked at all of the health facilities in Ouagadougou that could perform dengue testing. We identified 15 health structures in total, divided as follows: 4 tertiary health facilities, 3 secondary health facilities, and 8 private clinics.

We included in this study all patients treated for dengue who had positive antigenic and/or serological tests (NS1 antigen positive and/or IgM positive). Patients who tested positive for NS1 antigen and/or IgM were classified as having primary dengue. Secondary dengue was diagnosed when these two markers were isolated or co-occurred with IgG positivity. Patients with only anti-dengue IgG and those with dengue suspicion (undocumented by an antigenic and serological test) were excluded from the study [3]. The biological test used was the SD Bioline dengue duo, which detects AgNS1, IgM, and IgG.

Operational definitions

Severe dengue fever is defined as probable dengue fever with at least one of the following severity signs:

Plasma leakage with hemoconcentration defined as a hematocrit greater than 45 % Severe bleeding is defined as diffuse and/or abundant bleeding with deglobulization requiring blood transfusion.

Organ failure: acute hepatitis defined by acute cytolysis (Aspartate aminotransferase or ASAT>1000 IU/litre, Alanine aminotransferase or ALAT>1000 IU/litre); encephalopathy defined by Glasgow score 13; renal failure defined by creatinine elevation>120 micromoles/litre.

Hypovolemic shock is characterised by plasma leakage combined with shock syndrome or respiratory distress.

Severe thrombocytopenia is defined as a platelet count of less than 20 103 per microliter

Collection of data and statistical analysis

Data were extracted from the patient's medical file and laboratory records. When clinical data were unavailable, patients were contacted by phone to learn more about their symptoms and treatment options.

The questionnaire included socio-demographic characteristics (age, gender, educational level, and occupational activities), history and co-morbidities (asthma, diabetes, hypertension), clinical characteristics, biological results (thick blood smear or malaria RDT, blood cells count, biochemistry), the WHO dengue classification 2009, and the status of patient evolution (complications, deaths).

We compared patients with primary dengue fever and patients with secondary dengue fever for the investigation of severity signs. The level of significance was set at 0.05. The Epi-Info version 7 softwares were used to analyse the data. The Chi 2 test or the Fisher's exact test is the statistical tests used for statistical comparisons (if Chi2 conditions were not met). A logistic regression was used to perform univariate and multivariable analyses with dengue infection as the dependent variable. This dependent variable was a binary variable, with a value of 1 indicating a primary infection and a value of 0 indicating a secondary infection.

Ethical considerations

Each participant signed an Informed Consent Form (ICF). For those aged 8 to 17, an assent form was obtained, as well as informed consent from at least one parent or legal guardian.

Laboratory analysis

The study population is made up of suspicious individuals from various health facilities in BoboDioulasso (CHUSS Bobo-Dioulasso, the health district of Do, and the health district of Dafra).

Whole blood 4ml was collected by venipuncture at the elbow bend on an anticoagulant (EDTA) tube for the blood count and on a dry tube for the detection of dengue markers.

SD BIOLINE Dengue Duo immunochromatographic technology was used to screen for dengue markers (NS1 antigen, IgM, and IgG). This test detects

the four DENV serotypes in serum, plasma, and whole blood.

The blood count was performed using the Mindray BC 6800 controller. This automaton employs the flow cytometry technique, which entails propelling cells one by one at high speed (more than 30km/h) in a hydrostatic flow and then passing them in front of a light source (laser) to recover the fluorescence of an immuno marking beforehand, allowing the counting of the figured elements of the blood according to their size, concentration, and granulometry.

DISCUSSION

Dengue fever is present in 35.42% of the population. The subjects have an average age of 30.4 16.17 years. With 15%, the age range of 21 to 30 is the most represented. These findings corroborate those of Moses in 2016, who discovered an age range of 11 to 20 years with a frequency of 28.96% .

Furthermore, demonstrated that adults are also infected with dengue fever. Our findings could be explained by the fact that the Aedes mosquito is diurnal and that the age group 21 to 30 appears to be more mobile (workplace, leisure, travel).

In our study, no statistically significant difference between subjects infected by sex was found (p=0.2, 0.8, 0.6).

In addition, Bicaba et al., in Burkina Faso in 2017, discovered that 52.2% of dengue cases are female patients. Us could be linked to a problem of likely under-medicalization of dengue cases. However, the mechanism is still poorly understood.

The CHUSS accounts for 7.62% of the 130 infected patients, the district of Do 11.98%, and the district of Dafra 15.80%. However, the district of Dafra accounts for half of the infected patients, which could be justified by the presence of Aedes deposits in this district.

We also discovered that the frequency of NS1 antigen during infection is higher than that of IgM and IgG, though this difference is statistically insignificant (p=0.07). Yougbaré et al. found the proportions of 79.2% for Ag NS1, 20.7% for Ig G alone, and 1.8% for IgM and IgG in the city of Ouagadougou in 2014. It demonstrates that direct markers are more common than indirect markers in the early diagnosis of dengue fever. As a result, it appears prudent to improve direct dengue diagnosis in order to develop ultrasensitive tests.

Thrombocytopenia and bleeding are common complications of dengue infection. The mechanisms underlying these disorders are multifactorial. Due to the scarcity and safety concerns of blood products in resource-limited settings, prophylactic platelet transfusion is not recommended, as no benefit in reducing severe bleeding or improving platelet count recovery was demonstrated. More research is expected to be conducted in order to better understand this issue.

Severe dengue fever is a common occurrence in West Africa. Renal failure, severe bleeding, and plasma leakage were the most commonly observed severity signs. Primary dengue, as demonstrated, is a cause of hemorrhagic complications. This study confirms the need for additional research into dengue fever severity factors. Furthermore, better environmental sanitation and dengue fever knowledge among health workers are urgently required to reduce the social and demographic consequences of dengue fever. However, in order for successful actions to be taken, all socio-political and health stakeholders must commit [4].

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